

# Compressorless Gas Storage and Regenerative Hydrogen Purification, Phase I

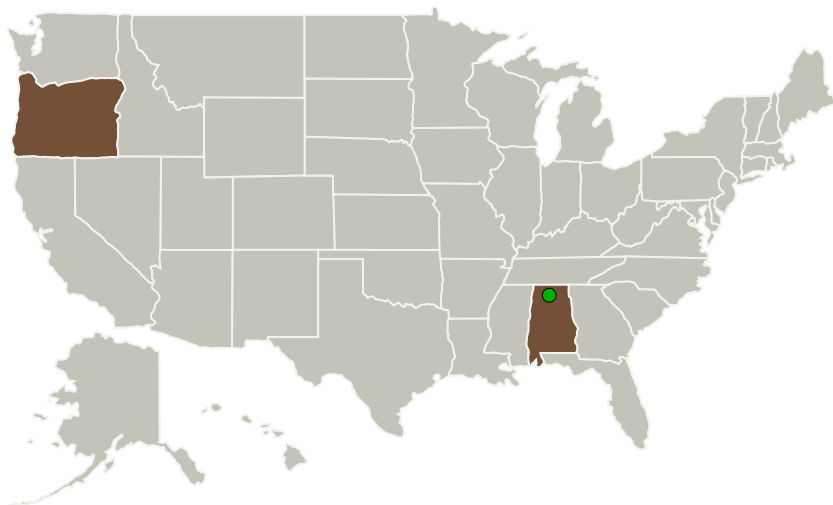
Completed Technology Project (2014 - 2014)



## Project Introduction

Microwave regenerative sorption media gas storage/delivery techniques are proposed to address both compressed gas management and hydrogen purification requirements in support of crewed deep space exploration missions. By reducing or eliminating the need for a conventional gas compressor, both the crew habitat noise level and required storage pressure for important Air Revitalization (AR) gases, such as oxygen and carbon dioxide, are reduced by using this technology. In addition, with slight modifications, the same concept can be used to serve as a regenerable hydrogen gas purifier. In either application, the penetrative nature of microwave heating is utilized to efficiently drive gas desorption from physical sorbents. For the compressorless gas storage application, the microwave desorption step supplies pressurized gas to downstream processes. Similarly, for application as a hydrogen purifier, microwave heating drives off captured contaminants from the sorbent bed (which is held at relative vacuum) during regeneration. Potential contaminants present in the hydrogen stream include water vapor, carbon monoxide and various hydrocarbons (including methane, acetylene, ethane, and ethylene).

## Primary U.S. Work Locations and Key Partners



Compressorless Gas Storage and Regenerative Hydrogen Purification, Phase I

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Organizations Performing Work	Role	Type	Location
UMPQUA Research Company	Lead Organization	Industry	Myrtle Creek, Oregon
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

Primary U.S. Work Locations	
Alabama	Oregon

## Project Transitions

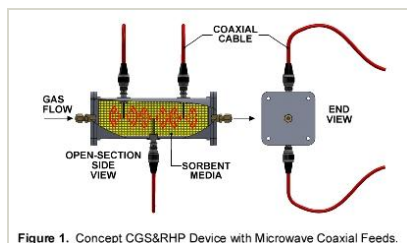
▶ **June 2014:** Project Start

✓ **December 2014:** Closed out

**Closeout Documentation:**

- Final Summary Chart(<https://techport.nasa.gov/file/137681>)

## Images

**Briefing Chart**

Compressorless Gas Storage and Regenerative Hydrogen Purification, Phase I

(<https://techport.nasa.gov/image/135596>)

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

UMPQUA Research Company

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

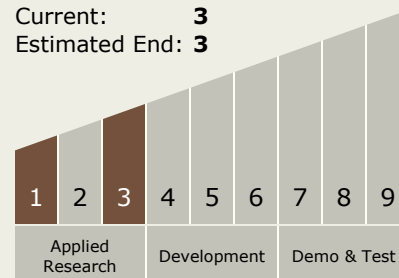
Carlos Torrez

**Principal Investigator:**

Richard Wheeler

## Technology Maturity (TRL)

Start: **1**  
Current: **3**  
Estimated End: **3**



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## Technology Areas

### Primary:

- TX06 Human Health, Life Support, and Habitation Systems
  - └ TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - └ TX06.1.1 Atmosphere Revitalization

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System